

Class XI

Kinetic Theory of Gases worksheet 1

1. What is an ideal perfect gas? 1

Ans. A gas which obeys the following laws or characteristics is called as ideal gas.

1) The size of the molecule of gas is zero

2) There is no force of attraction or repulsion amongst the molecules of gas.

2. State Charles's law? If air is filled in a vessel at 60°C . To what temperature should it be heated in order that $1/3$ of air may escape out of vessel? 1

Ans. Acc. to Charles's law, for pressure remaining constant the volume of the given mass of a gas is directly proportional to its Kelvin temperature.

$$V \propto T$$

$$\frac{V}{T} = \text{const.}$$

$$V_1 = V$$

$$T_1 = 60^{\circ}\text{C} = 60 + 273 = 333\text{K}$$

$$V_2 = V + \frac{V}{3} = \frac{4V}{3}$$

$$T_2 = ?$$

$$\text{Now, } \frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$\frac{V}{333} = \frac{4V}{3T_2}$$

$$T_2 = 444\text{K}$$

3. Show that average kinetic energy of translation per molecule of gas is directly proportional to the absolute temperature of gas? 2

Ans. Derive $\frac{1}{2}mC^2 \propto T$

4. Air pressure in a car tyre increases during driving? Why? 1

Ans. During driving, the temperature of air inside the tyre increases due to motion. Acc.

to Charles's law, pressure \propto Temperature,

\therefore As temperature increases, Pressure inside the tyres also increases

5. Four molecules of gas have speeds 2, 4, 6, 8, km/s. respectively. Calculate 1) Average speed 2
2) Root Mean square speed?

Ans. 1) $v_{av} = \frac{C_1 + C_2 + C_3 + C_4}{4} = \frac{2 + 4 + 6 + 8}{4} = \frac{20}{4} = 5\text{kms}^{-1}$

$$2) v_{rms} = \sqrt{\frac{C_1^2 + C_2^2 + C_3^2 + C_4^2}{4}} = \sqrt{\frac{2^2 + 4^2 + 6^2 + 8^2}{4}} = \sqrt{\frac{120}{4}} = 5.48\text{kms}^{-1}$$

6. What are the assumptions of kinetic theory of gas? 3

Ans.

7. Derive an expression for the pressure due to an ideal gas? 3

Ans.